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LECTURES ON HERNIA.

GIVEN AT THE CITY HOSPITAL, BOSTON.

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No. I.—*On the History, Anatomy, Varieties, Statistics and Cause of Hernia.**

THE escape of any viscus from its containing cavity, called hernia, probably owed its name to the Greek *ēgros*, a branch, or offset; an offset from the peritoneum, somewhat analogous in form, and in form alone, to the *diverticula*, which are common as an error of formation in the ileum. This offset, when it becomes sufficiently enlarged to receive the escaping bowel, is called the *hernial sac*.

Various estimates have been made as to the frequency of this infirmity in proportion to all mankind, which vary from one in eight to one in sixteen. Probably a mean of one in twelve is sufficiently correct.

If, then, eight per cent. of all our race are afflicted with hernia, it is not strange that the attention of medical men in all ages should have been directed to its observation, nor that the literature of the subject should be immense in range and exhaustive in research.

Passing by the earlier writers, from Hippocrates and Celsus down, we find not much of any value to us now until about a century ago.

In 1757, Camper published the first plates on Hernia worthy of the name. These were wood-cuts, in folio form, and were sufficiently accurate in anatomy, though rough in execution.

Sir Astley Cooper, in 1804, gave to the world his admirable treatise on Hernia—inguinal, crural and umbilical, as well as the

* It is not pretended that these papers on Hernia contain anything essentially original or new. As abstracts of clinical lectures, delivered unwritten, and illustrated by cases, they were subsequently condensed and written off. They are merely short-hand, and it is hoped clear and succinct, notes on rupture. They are designed to render clearer to the student, what we have always found difficult to teach, the anatomy of hernia.

And it is hoped that the subsequent papers on the Differential Diagnosis, the Operations for a Radical Cure, and the Treatment of Irreducible and Strangulated Hernia, may present some points of interest to the physician.

rarer forms.* Published in large folio, with steel engravings of good merit, they yet owed their chief excellence to the descriptive text—so terse, clear, simple and direct, that, to our thinking, it has not been equalled since.

The plates were far surpassed by Scarpa in 1809.† The great Italian anatomist was so fortunate as to secure in Anderloni an engraver, who afterwards made himself a familiar name in classic works of art. As illustrations of the anatomy of a region peculiarly difficult to represent, they equal in clearness Albinus and Vesalius in other departments.

From 1806 to 1829, the two Hesselbachs—father and son—who gave their family name to the triangle which lies between the *rectus abdominis* and the obliterated *hypogastric* artery, published monographs on Hernia.

But as exhaustive reviews of the subject, it would be hard to surpass the theses of Cloquet, offered in concours, in Paris, in 1819.‡ These essays were based on 500 dissections of herniæ in the dead subject, on 200 preparations, and 600 drawings. Such industry may well put to the blush more modern efforts.

Langenbeck, of Berlin, in 1817, published a monograph on Hernia.

Perhaps the best known and most read of later works has been that of Lawrence, in 1838.§ This is a compendium, in the English language, of all other writings.

Not much later, Morton published, in London, some beautifully colored illustrations of Hernia.

Finally, in 1863, Mr. John Wood issued his monograph on Rupture and its Radical Cure.||

In the fourth volume of Holmes's Surgery will also be found an admirable review of Hernia by Mr. Birkett.

Taken in the order of frequency, oblique inguinal, crural, direct inguinal and umbilical comprise those herniæ which escape through the natural apertures left for the passage of the testis, or round ligament; the femoral vessels, and the omphalo-mesenteric vessels and duct; while thyroid, sciatic, perineal, vaginal and diaphragmatic herniæ are not only far more rare, but differ also in forcing for themselves a passage through the weak spots of the pelvic outlet, or the diaphragm. The term ventral hernia is restricted to that which occurs through a wound of the abdominal walls, or between the *recti*

* The Anatomy and Surgical Treatment of Inguinal and Congenital Hernia. By Astley Cooper, F.R.S. London. 1804. Folio, with Steel Plates. Also, of Crural and Umbilical Hernia. Folio. 1807.

† Sull' Ernie, Memorie Anatomico-Chirurgiche. Di Antonio Scarpa. Edizione Seconda. Pavia. 1819.

‡ Recherches Anatomiques sur les Hernies de l'Abdomen. Par Jules Cloquet. à Paris. 1817. Recherches sur les Causes et l'Anatomie des Hernies Abdominales; Thèse Soutenue publiquement. Par Jules Cloquet. 1819.

§ A Treatise on Ruptures. By W. Lawrence, F.R.S. Fifth Edition. London. 1838.

|| On Rupture, Inguinal, Crural and Umbilical; the Anatomy, Pathology, Diagnosis, Cause and Prevention; with new methods of effecting a Radical Cure. By John Wood, F.R.C.S. London. 1863.

muscles separated by pregnancy; and, finally, internal hernia is a term sometimes applied to strangulation within the abdomen.

The terms bubonocoele, scrotal hernia, enterocele and epiplocele do not need remark. But there are two terms, used by older writers, which demand explanation, as they might mislead. They are *hernia humoralis*, meaning orchitis; and *hernia varicosa*, a varicocele or cirsocele.

The whole anatomy of oblique inguinal hernia may be summed up in the descent of the testis, and the changes it imposes on the parts through which it passes. The testicle, in the earlier part of the foetal state, lies just below the kidney, and, like the latter, just behind the peritoneum, by which it is partially enveloped in front. The gubernaculum, or leading string, which guides it to the scrotum, has developed upon it, according to Mr. Curling, three sets of muscular fibres—one set attached to Poupart's ligament, a second to the pubes, and a third to the scrotum. As the testicle descends along the psoas muscle, the first set direct it to the inner abdominal ring; the second draw it through the canal, while the third conduct it to the bottom of the scrotum. The testicle passes through these fibres in its descent, and they become involuted on the spermatic cord, forming the loops extending down from the internal oblique over the cord and returning to the pubes, under the name of cremaster muscle. But the testicle also pushes before it the peritoneum which over-lies it, and thence protruding it in a bag or sac, in its descent through the inguinal canal, carries a double layer before and over it to the bottom of the scrotum. Here the two layers invest the testis in a double covering, with a serous sac between—the cavity of the tunica vaginalis. Just as in all serous investments, the organ lies behind the membrane: one layer invests the testis in front, named the *tunica vaginalis testis*, or *propria*; the other layer adheres to the scrotum, which it lines, under the name of *tunica vaginalis scroti*, or *reflexa*. This may be rather trite anatomy to go over, but it seems necessary to review it, for a fair understanding of the subject. When the testicle descends, it leaves an open pouch of peritoneum behind it, which becomes entirely cut off afterwards, in the normal state. It is upon certain imperfections in this closure that the varieties of oblique hernia and of hydrocele depend.

When the closure of the pouch of peritoneum takes place between the scrotum and the abdomen, the lower pouch is called the *vaginal* process, the upper the *funicular* process of the peritoneum.

The first variation from the normal state is where the pouch does not close at all, and remains one cavity from the abdomen to the bottom of the scrotum. Through this the bowel slips down and forms a congenital hernia, lying in contact with the testis.

In the next form an attempt is made at closure, but is not fully carried out. The common canal becomes occluded at one point near the external ring; the funicular process shrinks up within the inguinal

canal, but the vaginal process remains open up to the external ring. Thus we have all connection with the peritoneum closed; but the closed cavity of the tunica vaginalis seroti reaching up on the cord as high as the external abdominal ring. If, then, a hernia protrude, it pushes before it its own pouch of peritoneum, and emerging at the outer ring, descends into or behind the large vaginal sac; and we thus have the anomaly of a rupture covered by two serous sacs instead of one. This is called *encysted* hernia—sometimes infantile hernia, but that is a misnomer.

In the third variety we have the connection between the serotum and the common peritoneal cavity completely cut off; the vaginal process contracted to a normal size around the testis, but the funicular process dilated and patent for a short distance on the cord. Into this dilatation, which extends from the inner ring to a point an inch, more or less, below the outer one, a knuckle of intestine may gradually descend, and thence creep slowly down into the serotum, where it does not lie in contact with the testis, but, usually, in front of the tunica vaginalis. This is the form of common oblique hernia, which comes on slowly and spontaneously at some period between childhood and maturity; not congenital, but so gradual that the patient cannot define its exact period of origin. After reaching the serotum it is not distinguishable from the other ordinary forms of hernia.

Finally, we have the normal and perfect closure, where the vaginal process is converted into a serous sac around the testis, and the funicular process wholly retracted within the inguinal canal, where it assumes the name of infundibulum process, which envelopes the cord at the inner ring. The remains of the original serous passage shrink into an impervious mass, and, together with the traces of the gubernaculum, envelope the cord in loose areolar tissue. This, then, is the case in which either oblique or direct hernia occurs from a strain, or rupture, forms its own proper sac of peritoneum, emerges, in either case, at the outer ring, and descends into the serotum in front of the testis and tunica vaginalis; and the only difference in the covering of the hernia is, that when oblique it is surrounded by the fibres of the cremaster, and when direct it pushes before it the conjoined tendon.

The same varieties of closure of the pouch of peritoneum cause and explain the varieties of hydrocele.

If the cavity is entirely unclosed, we may have a congenital hydrocele, where the fluid will return into the abdomen.

The vaginal process may be closed below, and one or more separate serous pouches exist above on the cord, either without or within the inguinal canal, and this constitutes hydrocele of the cord; or, finally, we may have entire closure above and below, and dropsy of the cavity of the tunica vaginalis testis and reflexa, constituting common hydrocele, beginning at the bottom of the scrotum.

Somewhat analogous changes occur in the passage of the round ligament in the female; and the funicular process of peritoneum which remains patent is then called the canal of Nuck. Wrisberg, in 19 out of 200 female bodies found an opening leading through the ring into the labium lined by peritoneum. It may be the cause of a congenital inguinal hernia in the female. An account of the dissection of such a case by ourselves will be found in Vol. Lxx., No. 7, of this JOURNAL.

In femoral, or crural hernia, we have always similar anatomical changes to deal with, without the variety of conditions which we have described in the inguinal forms. This is because the crural ring and canal are not pervious for the passage of any viscus like the testis through them. We have, it is true, a complex arrangement of fasciæ, which it is not necessary to dwell on here. But the pouch of peritoneum, forming the hernial sac, is always the same offset from the great peritoneal cavity; and the only difference is as to whether it be arrested at the crural ring or extend down through the saphenous opening.

In umbilical hernia, again, we have a simple and constant arrangement of parts. In infancy, the pouch of peritoneum protrudes through the unclosed foetal opening for the umbilical cord. Its coverings are only the skin and superficial fascia. It thus becomes very thin; the peritoneum in old cases is nearly absorbed, and it seems as if the hernia might burst through. Such herniæ are very dangerous to meddle with by operative procedure. In the umbilical hernia of adults, occurring mostly in obese females, we quite frequently have the rupture protruding through a small opening in the sheath of the rectus, near the umbilicus; being really a ventral hernia, though appearing to be an umbilical one.

An imperfect nomenclature has given rise to most of the difficulty of understanding and describing hernia. Thus the two pillars of aponeurosis of the external oblique muscle, which environ the outer ring, called external and internal, should be called lower and upper. The outer abdominal ring, though outermost with reference to the plane of the abdominal muscles, is innermost with reference to the median line of the body; and the inner abdominal ring, in like manner, is farthest out from the median line.

So, too, oblique inguinal hernia is called external, because it passes outside the epigastric artery, although it emerges from the abdomen through the inner ring; and direct inguinal hernia is called internal, because it lies inside the epigastric artery, although it passes directly out of the external abdominal ring.

If possible, a worse confusion occurs in naming the fasciæ concerned in femoral hernia.

Thus we have the iliac portion of the fascia lata forming Hey's ligament, or the outer, false border of the saphenous opening; and the iliac fascia proper, lining the iliacus internus muscle within

the pelvis, and forming the posterior half of the sheath of the femoral vessels. Also, the transversalis fascia forming, above Poupart's ligament, the posterior wall of the inguinal canal, and below the ligament, by another expansion of it, forming the anterior sheath of the femoral vessels, or fascia propria of femoral hernia.

In mapping out the anatomy of the inguinal region, the great land-mark is the spine of the pubes. It can always be felt, even in the most unfavorable subject. Into the pubic spine is inserted the lower or outer pillar of the outer ring; and passing across to the symphysis, just above the spine, is the upper or inner pillar of the same opening. Over and a little outside the spine of the pubes the external abdominal ring is inevitably to be found. It may be best felt in the male by placing the finger at the bottom of the scrotum, and invaginating it up into the ring. Just above, and at the middle of Poupart's ligament, is the internal abdominal ring. Below Poupart's ligament, and about midway between the outer and inner abdominal rings, is the crural or femoral ring.

These relations are constant, and by starting from the pubic spine we can make them all out.

Thus, we can distinguish a femoral from an inguinal hernia, even though the former be rolled up into the site of the latter, by either drawing down the tumor and seeing if the neck be below or above Poupart's ligament, or by finding the pubic spine, and exploring the external abdominal ring.

The statistics of the London Truss Society for twenty-eight years, embracing a total of 83,584 cases of hernia, go to prove:—

First, That hernia is more frequent in males than females, there being 67,798 males to 15,786 females—or four to one. This must be taken with some allowance for the fact that women are more apt to conceal, and less apt to seek aid for hernia, than men. But the great preponderance of males is probably to be explained by their more laborious pursuits.

Second, That hernia is more common on the right side than the left, in both sexes. Thus of males, 24,316 right side to 14,006 left, or 2 to 1. Females, 3,256 right to 2,255 left, or 3 to 2. Cloquet assigns as the cause of this, that in most severe labor we use the right side in such a way that a line drawn perpendicular to the plane of the diaphragm falls over the right inguinal region, and the strain comes on the openings of the right side.

Third, That inguinal hernia is the more common form in males, and femoral in females. Thus of inguinal hernia, 38,322 males to 1,097 females; and of femoral hernia, 699 males to 5,511 females. The cause is to be found in the anatomical differences of the sexes. In the male the inguinal canal is dilated for the testicle and cord. In the female the greater width of the wings of the ilium, and consequently of the femoral arch, leaves a larger crural opening, and predisposes to that form of hernia.

Fourth, That umbilical and ventral hernia are more common in females than males. Of umbilical, 2,775 females to 664 males. Of ventral, 415 females to 209 males. This is probably due to causes incident to pregnancy, and the separation of the recti muscles. According to Mr. Syme, the straining in labor is also a common cause of femoral rupture.

The real cause of hernia, apart from accidental rupture by sudden over-exertion, we believe to be, in great degree, hereditary; in other words, that a tendency to loose rings, or to various degrees of imperfect closure of the funicular process of peritoneum, runs in families, or descends from father to son. Great length of the mesentery or omentum has been assigned as a cause, but this would seem to be negatived by the occurrence of hernia in children, in whom those structures are very short.

The mode of formation of the hernial sac is of interest and importance. This pouch of peritoneum is distinguished into a neck, where it emerges from the rings; a body, and a fundus or dilated extremity. In the congenital hernia the neck is nearly as broad as the fundus. In the ordinary adult hernia the neck is narrow. In some sacs there may be one or more constrictions outside the rings; and there may be two, or even more sacs, in the same region, as figured by Cooper. The sac of peritoneum elongates and stretches as the rupture increases by the *vis à tergo* within the abdomen; and it, before long, becomes organized and thickened, and contracts adhesions to the serotum and inguinal canal. Thus it happens that in very many herniæ, perhaps the majority, the sac becomes irreducible back into the peritoneal cavity, although the bowel can be returned within the abdomen. We may have a hernia, without a sac, of the cœcum, or colon, or bladder, or any viscus which, not wholly enveloped by peritoneum, can slide down behind it.

Although the sac be adherent, if its contents can be pushed back into the abdomen, it is called a *reducible* hernia. But adhesions are very apt to take place between the contents of the sac, whether intestine or omentum, and the sac itself, as well as of the latter to the surrounding parts. If both these events occur, the hernia is called *irreducible*. If, now, a temporary stoppage of the peristaltic action of the bowel in the rupture takes place, through the accidental presence of flatus or a fecal mass, the hernia is called *incarcerated*. If this state of things continues unrelieved we have, next, *inflammation*. Here the position of affairs has become critical, but *may* be relieved by fomentations, rest, opium, &c. But, finally, if either the above condition continues in an irreducible hernia, or arises *de novo* in a reducible rupture—which has got suddenly down and been nipped, as it were, unawares—we have next *strangulation*, mortification and death, unless relieved by an operation.

No. II.—*On the Differential Diagnosis, and the Operations formerly proposed for the Cure of Hernia.*

WE have previously spoken of the means of distinguishing femoral from inguinal hernia. To distinguish between an oblique and a direct inguinal hernia, when recent, is easy; the older the ruptures, the more difficult the differential diagnosis becomes; for the inguinal canal grows shorter and shorter under the pressure of the hernia, until, in an oblique rupture, the rings are dragged opposite each other. Of course the relation of the hernia to the epigastric artery remains unchanged; but whether for taxis, or for operation, it makes but little difference to which kind such a hernia originally belonged. The taxis is almost directly backwards in these old cases; and in a strangulation we cut the stricture upwards, and would be equally sure to avoid the artery, whether it lay inside or outside the hernial sac.

Atrophy of the testis and varicocele are very common accompaniments of these long-continued ruptures. When, however, we want to diagnosticate hernia as hernia, or to distinguish it from other things, we need to seek for and use every means of diagnosis.

Hernia is diagnosticated, in the first place, by the impulse communicated to the hand, placed on the tumor, by coughing, or any expulsive effort. There is a false and a true impulse. The false impulse is that shock given to the hand placed over the inguinal region of a healthy person, and is due to motion communicated to the walls of the abdomen. The true impulse is a very different sensation. It is of a peculiar thrilling character, feeling like a shock transmitted through air and water. No words can describe a sensation accurately; but this impulse is also peculiar in being dilating and diverging. The tumor may be seen to dilate on coughing; and if we place two fingers on it, a little distance apart, they will diverge and separate from each other with every impulse.

One of the first things the patient notices is a bulging opposite the internal ring, in ordinary, oblique hernia. This may be accompanied with a feeling of something having given way, if the rupture be produced by violence, and the funicular process entirely closed.

It is, of course, in this early stage that the hernia is most amenable to treatment; but it unfortunately often happens that the rupture comes on so slowly and insidiously that the patient does not observe it until it has descended into the scrotum.

One of the first questions we ask the patient is, whether the tumor disappears on lying down. This is not only a diagnostic mark of hernia, but important as showing whether it be reducible or not; and it must be borne in mind that an adherent sac, or a small piece of omentum adherent to the sac, may be irreducible, and leave a small permanent tumor after the bulk of the rupture has been returned.

A hernia always grows from above downwards also, which distinguishes it from enlargements beginning in the scrotum.

Varicocele is perhaps oftener confounded with hernia than any other swelling; as before said, they often exist together. Varicocele, alone, is more common than hernia. Hernia is most frequent on the right side; varicocele on the left, from the peculiar distribution of the left spermatic plexus of veins. A varicocele may be very large; and, like hernia, it diminishes on the patient's lying down. The blood slowly flows back into the general circulation in the horizontal position. The feeling of the two tumors is different. Hernia is irregular, like the coils of intestine; and we can sometimes distinguish the convolutions through the skin. If omentum, it is soft and doughy in feel; if intestine, we have the yielding, bubbling sensation of air and water, and perhaps resonance on percussion. Varicocele is more rounded, and feels like a mass of irregular, but rather parallel threads or worms. Particularly if the patient be made to lie down, we can empty and distinguish the separate, dilated veins. We also often see varicose veins in the skin of the scrotum, in varicocele. Finally, there is no impulse in varicocele when the patient coughs.

Hydrocele, also, is very often confounded with hernia. In a true, typical hydrocele, formed in a closed tunica vaginalis, the diagnosis is not difficult; yet even here we may have hernia coëxisting, and lying on top of the hydrocele. A simple hydrocele is globular or pyriform in shape, and increases slowly from below upwards. It is usually transparent to transmitted light; but owing either to thickening of its investing sac, or to change in its contents, it is far from being transparent always in an old hydrocele. We can always feel the cord between a simple hydrocele and the outer ring. We find no neck to the tumor, losing itself in the inguinal canal, as in hernia. We have no impulse on coughing, and it slowly and steadily enlarges; and never recedes, or disappears, from changes in position. But if it be a congenital hydrocele, it runs up into the inguinal canal. It slowly disappears, emptying itself into the abdomen, through the patent vaginal process of peritoneum, on lying the patient down, and it has a thrilling impulse communicated by coughing. Its transparency, its shape and feel, and the slowness with which it returns into the abdomen, or recurs in the scrotum on standing up, are the chief distinctions of a somewhat difficult diagnosis.

In a hydrocele of the cord we have a hard, cyst-like tumor on the cord, without impulse and without change of shape or position. But if the hydrocele of the cord extend into the inguinal canal, we may have some impulse and reducibility, from non-closure of the funicular process, at the inner ring. These cases are often sufficiently puzzling.

A testis not descended into the scrotum, and becoming arrested in the inguinal canal or at its exit, may simulate hernia—that is, hernia still a bubonocoele. The want of impulse, the glandular feel, the pain on pressure and the peculiar appearance of the scrotum, are

usually enough for diagnosis. Sometimes, however, a late descent of the testis, complicated with hydrocele of the cord, or a rupture which may occupy the enlargement of the inguinal canal where the testicle lay, may render the diagnosis very difficult.

From *orchitis* (hernia humoralis) a rupture is distinguished by the history, acuteness, redness, inflammation and pain of the former, as well as the want of impulse and constant presence and increase of the tumor.

A *cancerous or tuberculous testis*, or one simply hypertrophied, may be mistaken for hernia; but we have the history, the gross appearances and the want of impulse to guide us.

From an *hematocoele* we may distinguish hernia by the same rules, with the added fact of ecchymosis.

Various *tumors* may exist in the inguinal or femoral regions to mislead us. These are fatty and glandular tumors, and cysts. They also are distinguished from hernia by having no neck, being irreducible, with no impulse, and being more or less movable under the skin.

Finally, we have *deep, chronic abscess*. A pelvic abscess, the result of pelvic cellulitis, appearing in the groin, is distinguishable from hernia by the walls of œdema and lymph which surround it. A *psoas abscess* is more deceptive. It generally has a soft sac without lymph. It descends in the femoral region, beneath Poupart's ligament, but outside the femoral artery. Sometimes, however, it comes down inside the artery, and in the course of crural hernia. But after passing through the crural opening, it spreads out beneath the fascia lata into an irregular, fluctuating swelling, and does not take the direction of crural hernia, through the saphenous opening. An impulse is felt on coughing, which gives a peculiar thrill to the finger. The history, constitutional condition, and, perhaps, the appearance of the spine, ought to furnish some marks of distinction from hernia.

So common an infirmity as hernia has led men in all ages to attempt its radical cure. Therefore we shall find that from Celsus down, patients have been subjected to all sorts of operations; all useless, and many of them cruel and unjustifiable. These attempts at a radical cure consisted of, rest; compression; medicinal applications; incision; excision; cauterization; ligature; the royal stitch; the punctum aureum; scarification; castration. There were another set, comprised in the present century. For convenience, we may divide all these operations into two classes:—1st. Those which deal with the sac alone; 2d. Those which attempt to cure by invagination.

The cure of hernia solely by *rest* has been tried, at intervals, from Fabricius to a recent date. In a report on it, in 1840, the following conclusions were arrived at:—that it is possible to cure hernia by the horizontal position long continued; that a diminution of the diameter of the canal and a restoration of its obliquity is obtained; but

that the patient must be possessed of considerable vigor, and that it is inapplicable in old cases, where the canal is reduced to a mere ring.

With regard to *compression*, much can be done. Malgaigne expressed the opinion that all hernias could be cured if proper attention were paid to the truss. Experience inclines us to the opinion that pressure is very uncertain in its effect, and cannot be relied upon except in children.

All trusses made for the radical cure are convex in the pad, with a very stiff spring. If the pad be hard, as well as convex, it is thought that it tends to dilate the outer ring more than to excite adhesions. Influenced by this belief, Mr. Wood has constructed an original truss, which is not rounded, but flat in its pressure, and which has a slot cut part way to allow the free passage of the cord and vessels unobstructed. Whenever we have seen this truss used it has been effectual, and worn with great comfort. It is of the highest importance in infancy and early childhood that a congenital rupture should be kept out of the inguinal canal, in order to give the parts a chance to close. We believe that the chances of cure by truss pressure are in direct proportion to the youth of the patient. Two months of occlusion of the bowel from the inguinal canal in infancy will do more for a radical cure than two years later in life. In infants it is very difficult to keep a truss in place without chafing. In them, it seems to us, that a flannel spica bandage might be worn, made to take off by buckles, and having at its point of intersection over the groin some hard pad, like sheet lead, sewed into it. Several of these could be kept ready, so as to change when they became wet; or a still simpler means might be employed, by retaining the rupture with a strip of isinglass plaster, which could be easily changed. The early and continuous treatment of umbilical hernia is of equal importance.

Almost every form of *medicinal application* was employed in the days of polypharmacy for the cure of rupture. Clandins gives a cerate of thirty-three ingredients, four of which were the blood of dragon, goat, man and bat. These, of course, are mere matters of curiosity.

Incision of the sac has been practised as late as 1832, when Larrey made an unfavorable report on it. *Excision* of the sac was done by Celsus, and in the middle ages.

Cauterization, though carried to a barbarous excess, really effected some cures. Repeated applications of the actual or potential cautery were made until the parts were destroyed down to the bone; and the pubes denuded of periosteum; when, after exfoliation, a contracting cicatrix became firmly adherent to the bone.

The *ligature* was used by Celsus, Paulus Aegineta and others, and consisted in dissecting out the sac and tying it below the ring, usually sacrificing the cord and testis.

The *royal stitch* was a modification of this, by which the testis was saved; and was so called from its saving subjects to the king.

To Ambrose Paré is due the *punctum aureum*—a more philosophic method—by which the sac was obliterated without injuring the cord. An incision having been made down to the sac below the ring, a golden wire was passed twice around it, and tightened, moderately, for three days. It was then cut short and left in the wound, which cicatrized over it.

Scarification of the sac has been done in older and more recent times, without injury.

The abominable practice of *castration* to cure rupture was done largely. The sac and testis, having been exposed, were torn from the scrotum, producing excruciating pain; and the sac was tied with a ligature. Other surgeons tore out the testis and concealed it quickly, that the bystanders might not see it. In 1710, a man was sent to the galleys for operating by castration; and in 1735, a woman was publicly whipped at Rheims for the same offence. Yet so late as 1799, in France, castration for rupture was practised by charlatans; and the Bishop of St. Papoul found five hundred in his diocese so mutilated.

Graefe's operation, described in Berlin so late as 1813, is almost as hazardous and rough. It consisted in dissecting out the sac and cutting it off just below the ring, and then inserting a plug of lint, rubbed with some irritating ointment, into the inguinal canal. A much more reasonable mode was that of concluding the operation for strangulated hernia by fastening a portion of omentum into the inguinal canal. Both Cooper and Velpeau succeeded in this manner in securing a radical cure.

Schuk, of Vienna, Rattier and Moesner, all operated by *setons*.

Belmas performed two very complex operations for a radical cure. The first consisted, essentially, in introducing a bag of gold-beater's skin into the sac of the hernia; the second mode was by inserting filaments of gelatine, as setons, into the sac. There were other minor points about the operation, which we have not space to describe here.

Bonnet operated by inserting wires, with corks on the ends, across the sac;

Mayor, of Lausanne, by stitches through the sac, retained and tightened by being fastened over sponges externally.

Malgaigne advocated acupuncture of the sac, and subsequent pressure.

Velpeau and *Pancoast* have both operated by injecting the sac with tincture of iodine, or cantharides. The difficulty consists in hitting the sac, by a subcutaneous puncture.

Velpeau and *Guérin* have also operated by a lance-shaped subcutaneous knife, pushed into the inguinal canal, and scarifying it, and then applying pressure.

Verdier advocates the frequent employment of a cold douche, with an upward jet.

These operations all deal with the sac alone; they convert a scrotal hernia into a bubonocoele, and a new sac is formed after a longer or shorter time, from the loose folds of peritoneum.

We now come to the second class of operations for a radical cure, which act by invaginating some tissue into the inguinal canal.

The first, and one which has been formerly quite popular, is *Gerdy's* method. He operated by stitching up the invaginated scrotum and sac to the inguinal canal and skin of the abdomen by several loops of ligature, whose free ends are tied over quills on the outside, and whose bellies hold up the invagination. He then denuded the invaginated skin of cuticle by ammonia, and hoped to get granulation and adhesion in the inguinal canal.

Syme did a very similar operation with a bit of catheter.

Signorini operated in a very bold way, which he called intro-retroversion. He invaginated the sac so far that he could stitch it round the inner margin of the crural opening, and thence to the skin of the thigh, where it was scarified.

Haller stitched up the invagination by threads passed through a bit of cork.

The operation of *Wurzer*, of Bonn, enjoyed the most repute previous to Wood's. It was done by the aid of an instrument, consisting of a perforated cylinder of wood, a needle within, with a false point, which can be unscrewed, and a second half-cylinder of wood to press down upon the skin over the inguinal canal. The operator invaginates the scrotum into the inguinal canal by means of the whole cylinder, and then pushes on the concealed needle, which pierces the skin of the abdomen near the inner ring. Its point is now unscrewed, and the half-cylinder fastened on to it by two screws—one at the needle-point, the other near the handle of the instrument. This is now screwed down moderately, so as to compress the wall of the abdomen and of the inguinal canal between it and the cylinder within the canal. If thought desirable, the invaginated skin can be denuded by acids. The apparatus is left on a number of days, until sufficient adhesive inflammation has taken place. This operation has met with some success.

M. Leroy d'Etoile has proposed an ingenious method for a slow, radical cure, by having a short invaginating plug fastened to a truss, which latter will keep up a constant, spring pressure on the canal.

That of *M. Sotteau* has many points of resemblance to *Wurzer's* operation, only it is more complicated. He drives needles through the invagination in the inguinal canal, from without inwards, and from within outwards, and, fastening blocks of wood over the points, compresses the skin.

According to Mr. Wood, these operations of invagination have failed for three reasons:—

First; because the skin of the serotum tends to draw out the invagination by its weight and elasticity.

Second; they dilate the rings, and make them more patulous than before.

Third; they fail to act on the posterior wall of the canal.*

No. III.—On Wood's Operation for a Radical Cure.

FOUR forms of operation for the radical cure of hernia have been proposed by Mr. John Wood, of King's College Hospital, London. They all aim to secure a subcutaneous union of the walls and pillars of the hernial opening, and a subcutaneous adhesion of invaginated tissues.

The first form has usually been done with a hemp suture, as follows:—

The patient is etherized, and the hernia reduced. An incision, about an inch and a quarter long, is made through the skin of the scrotum over the sac. The skin is subcutaneously separated from the spermatic fascia which invests the cord and tunica vaginalis, and in which the testis is loosely slung. This separation is carried so far that the spermatic fascia can be pushed up and invaginated, without drawing in the skin. The finger is then carried up into the inguinal canal, carrying this fascia and the hernial sac before it. The finger is hooked under the inner pillar and conjoint tendon, as high up near the inner ring as can be reached; the cord, meanwhile, lies behind the finger, in the fold behind Poupart's ligament, and out of harm's way. The *transversalis fascia* and the epigastric artery lie behind the finger. The peritoneum is wholly out of the way; unless the hernia be congenital, or the sac be adherent and irreducible, in which case it is perforated. The hernia needle is carried up on the finger; perforates first, the invaginated spermatic fascia and sac, next the conjoint tendon and inner pillar, and, finally, the skin of the abdomen. One end of the thread is then passed through the eye in the point of the needle, and the instrument withdrawn. Next the needle, still threaded, is passed up, a second time, on the finger, made to perforate the outer pillar, and then the skin of the abdomen, through the first puncture. A loop of thread being retained over the abdomen, the needle is withdrawn, and, still threaded, made to perforate the conjoint tendon, triangular ligament and inner pillar, close to the edge of the rectus muscle. Emerging through the

* NOTE.—We are indebted for the historical part of this paper, to a very great degree, to Dr. Bryant's Boylston Prize Essay, on the Radical Cure of Hernia, for 1847.

same puncture in the skin of the abdomen, the needle is unthreaded and withdrawn. We now have above, a loop, whose ends are through the outer pillar, and two free ends, which go through the conjoined tendon and inner pillar. These are now drawn up, and tied together over a roller, or block; thus drawing together the two pillars, the conjoined tendon, and the spermatic fascia and sac, and occluding the opening. The patient is put to bed, with a spica bandage applied, and, at the end of some days, when loose, the sutures are withdrawn.

Finding that the silk or hemp sutures cut through too soon, Mr. Wood substituted silvered wire; and, as this was difficult to manipulate with the needle armed, he modified the operation, as follows:—

Second Method.—The first steps, up to the passing of the sutures, are the same. The needle is made to perforate the conjoined tendon and inner pillar and skin, as before, and one end of wire hooked on, withdrawn through the scrotum, and disengaged from the needle. The latter is now passed up unthreaded, and perforating the outer pillar and skin, the other end of wire is hooked on and withdrawn, and unhooked. A loop is thus left above, and two free ends below. Then a third stitch is taken across the fascia and sac, in the scrotal incision, clearing the cord, and the wire drawn through that and disengaged. Finally, the lower wires are twisted together, drawn up into the inguinal canal, by pulling on the loop above, and the latter then firmly twisted down on them, in the puncture of the skin of the abdomen. The ends and loop are bent over a roller and fastened, and the hernial opening is thus occluded. After-treatment the same, with horizontal position, spica bandage, &c. The wires can be left in from ten to fourteen days, before loosening, and then withdrawn. Eventually, a truss is worn for six months; and if the operation succeed, the canal is firmly blocked by the invaginated tissues and lymph, and the tendinous openings and conjoined tendon adhere together.

The operation for femoral hernia is described further on, in connection with a case.

The fourth operation, by pins, is for young children, and consists in invaginating the scrotum, skin and all, without cutting, and skewering the pillars together by pins contrived for the purpose.

It will be seen that the principle of all these operations is the same.

Mr. Wood contends that all the operations which have been proposed previously to his own failed, either because they dealt with the sac alone, and thus converted a complete hernia into a bubonocoele; or because they tended to *dilate* the ring and canal by invaginating the skin of the scrotum, which latter also was prone to fall out and withdraw the plug, by the weight of the scrotum and elasticity of the skin.

He claims, as peculiar to his operation:—

First; to invaginate the spermatic fascia only, and to place the

denuded tissues in the most favorable condition for adhesion, subcutaneously.

Second; to draw together and tend to close, rather than dilate, the tendinous walls of the inguinal canal, by wire sutures, which are not prone to ulcerate, and which are subcutaneous.

Third; to draw forward and fasten the conjoined tendon to the invaginated plug of fascia and lymph, and to the anterior walls, and thus to obviate the tendency to future re-opening at the inner ring.

Before giving a tabular view of the results of operation, certain of my cases require special mention.

Case No. 6 and 7.—A very fat man, a mill operative, with double oblique hernia, complete or scrotal on both sides; rings large and patulous and very deep, beneath a thick layer of fat. Patient very desirous of some operation to enable him to retain his rupture with a truss, so that he can get his living.

He was operated on by the second method. Great difficulty was experienced in getting firm stitches, owing to the depth of the parts. One side broke down soon; the other remained partially occluded.

Case No. 9.—A man of 45 years, of a flabby habit of body, and looking older than his real age. A very large, direct hernia, in consequence of a kick from a horse, which lacerated the pillars of the outer ring very seriously. Rupture cannot be retained by truss. Is very desirous of an operation, expecting only to be able to keep rupture reduced, but not cured. Operated on by second method. At first a good deal of fibrous effusion. Able to keep up bowel by truss for several months, but, at the end of a year, had slowly relapsed.

Case No. 8.—A boy of 13, with oblique hernia; thinks it is not congenital. Operated on by second method. Wires loosened slowly. Allowed to get up at end of third week, with a truss. A varicocele becoming developed, was kept in bed again one week more. At the end of that time, he went about as usual; no impulse to be felt. It is now two years since operation; no impulse or bulging has recurred. There seems little doubt that this is a permanent cure.

Case No. 14 and 15.—A healthy child of 4 years; double congenital hydrocele, of large size, reaching midway down thigh. The child is rendered helpless by this malformation. Other measures having failed, a small quantity of biniodide of mercury was inserted into each sac. The effusion disappeared, but a double scrotal hernia soon followed. Both sides were simultaneously operated on by the second method. The sac on the left side was so large and thickened that, being irreducible, some doubt was felt whether the sac alone, and no bowel, were in the scrotum. The needle penetrated the peritoneal offset (sac), as it must in a congenital hernia or an irreducible sac. No trouble followed. The wire separated in a week. There was a fair effusion of lymph. A double, soft-padded truss was applied. At the end of one year, there is a very slight impulse. Rupture

ture does not descend when the truss is removed. No hydrocele. There can be no doubt that perseverance with the truss will effect a permanent cure; and the child is rescued from a state of complete helplessness, and restored to freedom of motion, and a better promise in the future.

Case No. 17.—A healthy female of 21 years. A small *femoral* hernia on the left side. Has existed for several years; very troublesome; often nipped; declares she cannot wear a truss on it; opening of crural ring quite small; hernia can be slowly returned. Patient clamorous for an operation, which was at first declined, but ultimately assented to.

The same instruments—wire, &c.—used as in the other operations. Patient etherized; rupture reduced. A short incision made over the tumor. The hernia needle first penetrated the iliac portion of the fascia lata, near the saphenous opening; then, emerging, it was directed up beside the femoral vein, and thence under and through Poupart's ligament and the skin of the abdomen. To this needle-point was threaded and attached one end of wire, which was drawn down and detached. Next, the needle was passed in and out through the pubic portion of the fascia lata, and thence on through Gimbernat's ligament and out through the skin of the abdomen, where the other end of the wire was threaded, drawn down and detached. Finally, a cross-stitch was taken in the sac and fascia, and the whole thing twisted down, bringing Poupart's ligament down near the fascia of the thigh, and thus tending to occlude the crural canal.

I was somewhat apprehensive of phlebitis or lymphatic engorgement, but none occurred. Everything went on very favorably. There was no impulse three months after operation. Patient wears Wood's femoral truss with ease.

The difficulties and risks of this operation are—the proximity of the great vein, the danger of striking the epigastric artery, the rigidity of the crural canal and arch, and the small amount of fascia which is movable enough to be invaginated.

The danger is greater, the chances of cure, *à priori*, less than in the inguinal operation.

This is the *first time* the operation has been done on the *living subject*, so far as I am aware. Mr. Wood describes the operation, as practised on the dead subject.

The following abstract gives the best condensation of all our cases :—

TABULAR STATEMENT OF TWENTY OPERATIONS FOR THE RADICAL CURE OF HERNIA.

Case.	Sex.	Age.	Nature of Hernia.	Mode of Operation.	Appearance after Operation.	Truss. Occupation.	Success.	Failure.	Ultimate Result.
1	Male.	7	Right oblique Inguinal.	Wire setons (Gerdy's method).	No impulse. Large plug of lymph.	Truss.	1	1	Truss neglected; child scorbutic. Lymph absorbed at end of five months. Hernia down.
2	"	11	Right oblique Inguinal.	Wires, by Wood's first method.	Moderate effusion.	Tr. for a few wks.	1	1	No relapse. Lost sight of at end of four months.
3	"	6	Left oblique Inguinal.	Silk, by Wood's first method.	Sutures slough'd through.	Truss.	1	1	Failure.
4	"	8	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Firm effusion.	No truss.	1	1	At end of eight months, lymph absorbed. Bulging at internal ring.
5	"	9	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Firm effusion.	No truss.	1	1	Lost sight of.
6 & 7	"	35	Double oblique Inguinal.	Wires, by Wood's second method.	One side occluded; the other not.	Double truss. — Operative.	1	2	Both ruptures recurred. Great obesity at time of operation.
8	"	13	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Varicocele.	Tr. a y'r. Store-boy.	1	1	Perfect success at end of 2 years.
9	"	45	Direct; torn by kick of a horse.	Wires, by Wood's second method.	Some impulse. Rupture reduced two thirds in size.	Truss. Hatter.	1	1	Gradually enlarged again.
10	"	22	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Moderate effusion.	No truss. Sailor.	1	1	At end of one year, recurred as bubonoele.
11	"	22 mos	Right oblique Inguinal.	Pins (Wood's).	No impulse. Plug of lymph very large.	Soft pad truss.	1	1	Recurred, with whooping cough.
12	"	48	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Small effusion.	Truss. Laborer.	1	1	Recurred, with cough, at end of three months. At end of one year still much diminished.
13	"	1	Right oblique Inguinal.	Wires, by Wood's second method.	Ring too small to get finger in deep enough.	Truss.	1	1	Broke down at once.
14 & 15	"	4	Double congenital, with congenital Hydrocele.	Wires, by Wood's second method.	Rings very large. Sac on left side very large and thick.	Double truss.	2	1	At end of one year slight impulse on both sides. Do not come down when truss is removed. No hydrocele.
16	"	23	Right oblique Inguinal.	Wires, by Wood's second method.	No impulse. Considerable suppuration.	Truss. Carpenter	1	1	End of ten months, some impulse. Lymph absorbed.
17	Female.	21	Left Femoral.	Wires, as proposed by Wood.	No imp. Small effusion.	Wood's Femoral Tr. Servant.	1	1	At end of five months.
18	Male.	10	Left oblique Inguinal.	Operation begun, and abandoned; hernia adhering to outer ring.	Slight imp. Small effus.	Truss. Merchant.	1	1	Recent operation.
19	"	22	Left oblique Inguinal.	Wires, by Wood's second method.	No imp. Large effusion.	Truss. Clerk.	1	1	Recent operation.
20	"	23	Left oblique Inguinal.	Wires, by Wood's second method.	No impulse after operation, 10.	Truss, 16. No truss, 3.	7	12	Recent operation.
20	19 M. 1 F.		10 Right oblique. 4 Left oblique. 2 Double oblique. 1 Direct. 1 Femoral.	Wood's second method, 14; first method, 2. Seton, 1. Pins, 1. Femoral operation, 1.					

Covering a period from March, 1863, to April, 1866. Three years. Twenty operations.

The results expressed in this table may be summed up briefly, as follows :—

Recent operations, - - - - -	2
Operation abandoned, - - - - -	1
Cases lost sight of, - - - - -	2
Successful, - - - - -	3
Failures, - - - - -	12
<hr/>	
Total, - - - - -	20

Of the twelve failures, four were cases that should not have been operated on; two on account of great obesity; one, because the rupture was direct and the result of laceration; one, because the ring was too small to properly admit the finger. Deducting these four cases, and deducting also the first five on the list, where the operations were recent, abandoned, or lost sight of, and we have left *eleven* fair, average cases—of these, 3 were successful, and 8 failed.

This gives a ratio of success of 27 per centum: whereas Mr. Wood claims 70 per centum of success in a total of 150 cases.

What fair rules can we deduce from the above results; limited in number, it is true, but accurate as far as they go?

I think there can be no doubt that this operation is based on the most correct anatomical principles, and is the most thorough of any proposed. If this will not produce a radical cure of hernia, there is but little prospect that any of the other operations will do so.

It would seem to be a safe operation. In our twenty cases we had no peritonitis, and no death. And a certain additional risk must have been added in our earlier cases from our inexperience as an operator. Mr. Wood reports one death in 150 cases. This solitary case was fatal from pyæmia, or blood-poisoning, and is no greater ratio of mortality than is found in any series of surgical operations, even the most trivial.

This operation palliates, if it fails to cure. It renders an uncontrollable hernia controllable by a truss, in many instances. It tends always to reduce the size of the rupture, and it gives Nature a chance to restore the parts by retention and adhesion. It will cure some adult cases, but they must be cases selected with care and judgment.

It will fail to cure some adult cases. It affords the best chance of a perfect cure in children, from 6 to 12 years of age—after the crying and restlessness of infancy and the first dentition are over, and during the formative period before puberty. Nature then tends to close the rings, and the adhesive inflammation set up by the operation, even if but temporary, is of great assistance in furthering this desirable result.

It is true that the same end may be sometimes attained by trusses—but they must be very faithfully applied for a long while, and an operation shortens this period essentially.

Some adults, also, are undoubtedly eventually cured by hard truss pressure, on the principle formerly advocated by Heber Chase. But the chances of cure by truss pressure alone, are far less in adults than in children.

This operation of Mr. Wood's has not been many years before the medical public. Time alone can fairly test it. It is very possible that all the lymph effused is finally absorbed. The question then arises whether the changes which have been set up in the obliteration of the sac, the approximation of the pillars and the conjoined tendon, and so forth, will prove sufficient to obviate a future tendency to hernial protrusion. It is very certain that we have seen absorption in some cases at the end of four and six months; and in others, of a year.

Having now done the operation some twenty times; having tried all of Mr. Wood's methods, by silk, wires and pins, and also the femoral operation proposed by him, we have preferred to let three years elapse before formally tabulating the results of our operations. Sufficient care, time and labor have been bestowed to guarantee success, if it were attainable in the patients who fell to our lot. Some were improper cases for operation; some were, doubtless, negligent of after treatment, but others were fair, average cases of rupture in healthy males. We must confess that our success has not equalled that claimed by the originator of the operation. What more experience, judgment or dexterity might effect, we know not.

It is, perhaps, not improper to say, that in a letter from Mr. Wood, received a few months since, he makes the following statements:—

"I have now had about 150 cases of hernia under treatment by my operation, of all kinds, young and old, severe and moderate. In nearly all, trusses had been fairly tried; in some, failing to retain the rupture, in the milder cases failing to cure it. All have been urged to let me know if the rupture returned. Of these 150, in 40 the rupture has come back, more or less, but seldom so large as before.

"Mr. Paget, Mr. Haynes Walton and Mr. Redfern Davis have repeatedly done the operation, with success. It has been done extensively in Liverpool, Dublin, in Berlin by Langenbeck, in India and Australia.

"Many cases which I show, have been operated on 4, 5, and 6 years, and have worn no truss after the first year. One man is continuing the laborious occupation of a market garden porter, without a truss, &c. &c.

"I have come to the conclusion that in very large and direct cases in adults after 40 years, only occasional cures can be looked for, but a diminution of the rupture may be calculated on.

"In children before puberty, and in young men, the success of the operation is so decidedly superior to the great uncertainty, and,

when probable, the slowness of cure by truss pressure, and the symptoms are so slight after the operation, that I should not hesitate in submitting myself or a child of mine to it, rather than endure the inconvenience and risk which a hernia, supported by a truss only, entails.

"After all it is an operation of expediency, and liable to all the objections with which such operations are assailed. No man is justified in pressing it upon his patient. He should lay the facts before him fairly, and leave it to him to decide."

We must remember also to tell the patient that he has got to submit to from two to three weeks confinement in bed; to not much pain, but to weariness from position.

It will be both interesting and important to watch for the verdict which time shall set upon this operation. It is to be hoped that it will be largely tried by other surgeons in our own country. Whatever its ultimate value, it promises a certain amount of relief to a most common and distressing infirmity.

No. IV.—*On Irreducible and Strangulated Hernia.*

If the diagnosis be clearly made out, we shall find that hernia, in all the conditions we have previously spoken of, as reducible, irreducible, or strangulated, requires a certain definite treatment. Apart from any procedure for a radical cure, all reducible herniæ require the application of trusses. We believe this rule to be without exception.

The same septicism which doubts the usefulness of medicinal remedies in disease, cannot be carried into the department of surgery. Here we see plainly that unless we act promptly and understandingly the worst results will follow. A rupture or a fracture cannot be safely treated by expectancy; and the too great trust reposed in nature, by neglecting to apply artificial pressure to retain the bowels which she has extruded through inherited deficiency, cannot be too severely reprobated. Too much importance cannot be attached to the prompt and efficient treatment of hernia, as soon as it is discovered. We apply a truss to a reducible hernia for two reasons: first, to insure the patient against the risks of strangulation; second, to assist nature to cure the infirmity. Of the second reason we have already spoken. The risks which a rupture entails are so great that it would seem idle to argue on the necessity of a truss; and yet we hear of physicians who say to mothers, that they need not concern themselves about a congenital rupture in their children, as the bowel will go up, and take care of itself. Now, apart from treatment for a radical cure, and apart from the risks of

strangulation, there is another grave reason why a truss should always be applied at once—and that is, that a hernia which stays down long soon contracts adhesions: first, of the sac to the neighboring tissues; next, of the bowel to the sac. And we have, before we are aware of it, an irreducible rupture, which cannot be cured, which cannot be returned, which cannot bear truss pressure, and which, while in constant danger of incarceration, is more dangerous to operate upon, for the relief of strangulation, than any other.

It sometimes happens that these irreducible herniæ contain omentum, instead of intestine; when this is the case they are of much less consequence. If the diagnosis be perfectly clear, and the tumor large and unwieldy, it may sometimes be removed with safety by excision. This is also true of irreducible herniæ through the umbilicus.

In any case of rupture, it is of importance to determine whether the sac contains omentum or bowel. Not unfrequently both are present; and it occasionally happens that the intestine is strangulated by the omentum. The differential diagnosis is not always easy. Intestine may be tympanitic, convoluted, elastic, and having the sounds and feeling of air and water together. It has also a more direct, thrilling impulse. Omentum is insensible, flat on percussion, doughy and inelastic. When reducible, they return into the abdomen differently: intestine with a gurgle and sudden collapse; omentum more slowly, evenly, and without noise. A mixed case is hard to distinguish; and it often happens that the omentum is irreducible and adherent, although the bowel goes back.

Other causes than those inherent in the rupture itself may prevent its reduction. A woman was brought into the Hospital last year, who had ascites and a double inguinal and single femoral hernia. The ruptures could not be returned, and she entered for symptoms of commencing incarceration. Here it was evident that the three ruptures were caused and prevented from reduction by the dropsy in the peritoneal cavity, which had dilated the rings and forced out the bowel. The fluid was drawn off by a trocar; and the ruptures returned readily, and were retained by trusses.

If an irreducible hernia become incarcerated and inflamed, the first symptoms are a stoppage in the peristaltic action of the bowels, with colic, and heat, swelling and pain in the hernial sac. It soon becomes much distended, red and shining; and unless the symptoms subside, will end in mortification and faecal fistula, if not in death. We cannot return the bowel, and an operation is in such a case the very last resort.

A few months since a man was brought to the Hospital in this condition, who had a large, hard, reddened scrotal tumor, tender on pressure, and irreducible, with colic and constipation. The history was that of an irreducible hernia of many years' duration. A warm bath, fomentations, opium and perfect rest eventuated in a subsidence of the inflammation and a resumption of the functions of the bowel.

The popular idea in such cases is to give purgatives, as it is in internal stoppage, or intussusception. Nothing could be worse to do. The bowels cannot move until relieved of stricture, and the cathartic only increases the action of the muscular coat, and hence the spasm and incarceration. Opium, fomentations and time are the great remedies in an *irreducible*, strangulated hernia; but they must *not* be relied on for a strangulated hernia which occurs *de novo*, or was *reducible* before. In these cases, time is the patient's worst enemy rather than his friend.

If milder means fail in subduing the inflammation in an incarcerated, irreducible hernia, we must not hesitate to operate, although the operation is fraught with far greater dangers than in an ordinary, reducible hernia become strangulated. We cannot probably return the bowel, and we have to leave open a large, hernial sac, with its contents. This risk, however, must be run sometimes. More than this, a case may occur where there are symptoms of peritonitis, and some evidence of an irreducible hernia, when it becomes our duty to cut down and see if stricture exists.

Sept. 22d, 1865.—A. W. C., æt. 18, after exposure to cold and wet, was seized with a chill on the 19th, followed by fever, and pain in the right iliac region. All symptoms now aggravated. On examination, a local bulging of the abdominal wall noticed just above the ilium. Hernia in the left scrotum, although the testicle had not descended; but rupture seemed soft, and partially reducible. On the 23d, he was worse, with pain and delirium. Pulse 100.

24th.—Still delirious. Pain and tenderness all over abdomen. Lies with his knees drawn up; breathes rapidly; expression anxious; pulse 160, and feeble; vomits drinks. After a consultation, it was thought advisable to cut down over the neck of the hernia—which could be felt to be irreducible—to see if there might not be a knuckle of intestine strangulated. An incision having been made down to the sac by Dr. Thaxter, as soon as the sac was opened, a purulent, serous fluid ran out. No strangulation was found. The hernial tumor was composed of a small piece of intestine, a piece of omentum and a small, soft testicle, with a vaginal sac below it. By some arrest of development, the testis seemed to have remained in the canal, although a sac was opened down towards the scrotum.

The patient sank and died, and, on opening the abdomen, general peritonitis was found, which radiated from the cœcum and vermiform appendix. No foreign body in the latter.

It would seem as if the symptoms of *strangulation* were plain enough not to be overlooked, and yet they often are. Particularly is this the case with female patients, by whom the existence of a small femoral hernia may be unknown, or concealed from false pride. The physician, therefore, should always be on his guard in such cases. The symptoms of strangulated hernia are, first, general distress; then colicky pains, constipation, except a discharge takes

place once or twice from below the stricture, and, finally, a reversal of the peristaltic action of the bowels and stercoraceous vomiting. With this, prostration, a cool, clammy skin, hiccough, a thready pulse, collapse, and ultimate death, unless relieved.

The stricture may take place either at the inner ring, the inguinal canal, the outer ring, or at the *neck* of the sac wherever situated, or in any constriction of the sac itself, or, finally, from one part of the contents of the sac, as the omentum, constricting the bowel which is with it. In femoral hernia the strangulation takes place either at the crural or the saphenous opening.

Occasionally, but very rarely, a strangulated hernia, which resists taxis, returns spontaneously, without an operation.

A patient was brought to the Hospital with strangulated hernia, which had been down thirty-six hours. There was no action of the bowels; pain and prostration, and vomiting of everything taken—at first bilious, then of grumous matter. The hernial tumor was small, hard, and resisted all taxis. He refused an operation. The next morning he was worse, and the tumor had a dusky, red hue, and the feeling of containing serum. Still obstinately refused an operation. He was therefore sent home. In the course of the next night the bowel returned of itself, and he recovered. Few people, appreciating the chances of both, would have taken that man's risks rather than the risks of an operation.

The *taxis*, or reduction of the hernia by direct manipulation, is always the first method tried with a reducible rupture which has become strangulated. It should always be done under ether, with the patient on his back and with the legs raised, to relax the fascia in the groin; the pressure should be gentle, and not too long continued. We should manipulate the neck of the rupture with one hand, and push up the fundus with the other. In an oblique inguinal rupture the taxis should be directed upwards and outwards; in a direct hernia, backwards; in a femoral hernia, downwards, backwards and upwards. No precise rule can be given as to how much force should be used, or how long continued. We should rather err, ourselves, on the side of gentleness; believing, as we do, that more harm is done by injudicious and violent manipulation, and by delay, than by an early operation.

Of eight strangulated herniæ brought into this Hospital, one returned spontaneously, two were reduced by taxis, and five required an operation. It is true that this average of only one fourth reduced by taxis may be too small for general practice, since cases come to a hospital only as a last resort. The taxis, then, should be tried fairly, and all the other adjuvant methods we are about to mention, but not too long.

A long-continued hot bath, with an opiate enema, or opium by the mouth, often relaxes the parts so that taxis will succeed. In the same way ether acts efficiently. Ice, or even a freezing mixture, ap-

plied over the sac, may contract the rupture so that it will return into the abdomen. Inverting the patient has been sometimes successful; although there is some danger of tearing the bowel if it have become softened by long and tight constriction. Insufflation through the rectum of air by a pair of bellows, or with a common rubber enema syringe, until the intestines are fully distended, has several times succeeded in withdrawing the strangulated knuckle of intestine. It has, also, many times failed, and seems open to the same objection of danger of rupturing the weakened bowel, as the treatment by inversion.

We must not lose too much time in these efforts. Cooper says that if he had femoral rupture down and strangulated, he would not let more than twelve hours pass without an operation, if other means failed. A small rupture, with a narrow neck and small rings, is much more liable to become strangulated than a large one. A femoral is, for the same reason, more dangerous than an inguinal hernia. A congenital hernia, or a large, old rupture, both having wide necks and rings, more rarely become strangulated.

There are two ways of operating, with or without opening the sac: the former, the older and classical and most widely approved method; the latter, the operation of Petit, revived by Mr. Luke, and other modern surgeons. If we can avoid opening the sac, we avoid the great risk of peritonitis; and, on the other hand, we run the risk of returning the hernia with the stricture uncut, or the bowel mortified. In femoral hernia, where the seat of stricture is frequently at the saphenous opening, we can operate more successfully without opening the sac than in inguinal hernia.

"The advantages of leaving the serous membrane entire," says Mr. Syme, "seem more than counterbalanced by the risk of wounding the intestine in dividing the stricture, of returning the strangulated parts in an improper condition, or the mischief that may arise from abortive attempts at reduction, when it is impeded by adhesions." Unless in a recent femoral hernia of small size, strictured at the saphenous opening, we should think it wisest to open the sac. When the sac is cut, there is often a gush of serum, the result of over-secretion from its peritoneal surface, and due to irritation. In any form of inguinal hernia, the stricture should be divided upwards; and in femoral hernia, upwards and inwards.

What disposition to make of a partly mortified bowel, has always been difficult to decide. Under how great a degree of congestion and strangulation, as shown by its various shades of color, it may be safe to return the bowel into the abdomen, each one must judge for himself. According to the views of Mr. Hutchinson, recently expressed in the London Hospital Reports, Vol. II., all patients operated on for strangulated hernia who die, die of peritonitis induced by the damaged intestine. We have, ourselves, seen a patient recover perfectly in whom the bowel was of a dark, beet color. When

the bowel is really mortified, there is no question that it ought not to be returned, but left outside to form a fecal fistula. A graduated compress and spica bandage may be applied over the site of operation, if the bowel be returned; if not returned, the external parts should be let alone. The mortality of the operation for strangulated hernia is between 40 and 50 per cent. Of our five cases of operation, three died. We will conclude with a condensed report of these cases, from the Hospital Records, and a few remarks upon them.

CASE I.—Anne M., æt. 37. Strangulated femoral hernia for six days. Constipation, vomiting, singultus, during that period. Disease not recognized. Treated by cathartics. Now, a hard tumor, as large as an English walnut, in femoral region; skin red and ecchymosed. Under ether, gentle attempts at taxis were ineffectual; it was not thought justifiable to carry them far, for fear of rupturing the bowel. The sac was cut down on and opened. Bloody serum flowed from it. Sac found irreducible, and the intestine, which was of a light chocolate color, was adherent to the sac. The adhesions were carefully divided, and the bowel, apparently, freely returned into the abdomen. But little relief to symptoms after operation. She died on the sixth day. Autopsy.—Intestine found *still constricted* by peritoneum at the inner edge of the crural opening. Hernia sloughy, and intestine adherent to sac.

CASE II.—Eleanor F., æt. 38. Strangulated inguinal hernia. Three days since hernia got down, having always been reducible before, and yesterday colicky pains and vomiting set in. A hard tumor, size of an egg, now in right groin; tender on pressure; seemed to recede somewhat after taxis for fifteen minutes. The pain diminished, vomiting ceased, and she slept. The next morning taxis was renewed, under ether, without much effect. A large enema ordered. The next day, some vomiting; less pain; pulse 84. On the third day since entrance she became worse, with tympanites; vomiting and growing weaker. The operation for strangulation was done by Dr. Thaxter. Sac opened; serum in sac, which was thickened; no adhesions; intestine dark brown; stricture divided at external ring; bowel gently and easily reduced. A few minutes after, accidental pressure having been made on the abdomen, liquid fecal matter ran out. It was evident that the bowel had ruptured. She died in a few hours. No autopsy.

CASE III.—Mrs. S. H., æt. 40. Strangulated femoral hernia for twelve hours. Hernia of a year's duration. Never worn truss. Vomiting and colic all day. Repeated and violent attempts at taxis had been made before she came to Hospital. Now, countenance anxious and flushed; pulse quick; vomiting and pain. Hernia larger than an egg, in crural region, firmly fixed, with thin walls, quite livid. Very little and very gentle taxis tried. Operation; sac opened; serum and a dark-brown knuckle of intestine; no adhesion; stricture divided, and bowel easily reduced. The next day she rallied.

On the fourth day she died, with vomiting, tenesmus, and collapse. No autopsy could be obtained.

CASE IV.—Chas. M., æt. 35. Strangulated inguinal hernia for twelve hours; always reducible previously. Now, vomited ever since strangulation. Left side of the scrotum as large as the fist; tense and tender. Attempts at taxis were made by Dr. Thaxter, and in the inverted position, in vain. Ice was applied with no better effect. Tumor cut down on by a long incision; sac opened. A large mass of omentum protruded, and in its folds was strangulated a fold of intestine, intensely congested. No stricture elsewhere. The hernia was easily reduced, and the patient recovered without a bad symptom.

CASE V.—Mrs. B. C., æt. 42. Strangulated femoral hernia; twenty-four hours' duration. Now, pulse weak; skin cool and clammy; retching, dragging pains and prostration. A small, hard tumor in left groin, below Poupart's ligament. Taxis was used under ether without avail. The pulse became so feeble that it became necessary to stimulate her, and to operate at once. The stricture was found to be at the saphenous opening, and the hernia was reduced without opening the sac. She slept well that night, had three dejections next day, and recovered without an unpleasant symptom.

It thus appears that of these five cases of operation for strangulation, in two the cases were long delayed before the operation, and both died. In three the operation was done after a short period of strangulation, and only one died. Besides this, we find that of two of the shorter cases, one, with a strangulation of only twelve hours, and much the stronger woman, died. The other, with a strangulation of twenty-four hours, and a feeble woman, recovered. In the former, long-continued and violent taxis was used, and the bowel found chocolate colored. In the latter, very moderate taxis; and no bad symptoms followed the reduction.

This limited series of cases would seem to point to the general conclusion, that long delay and violent taxis, before operation, may be even more fatal than strangulation itself.

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